

What is claimed is:

- 1 1. A molten metal pump comprising:
 - 2 a motor;
 - 3 a drive shaft comprising a motor shaft coupled to a rotor shaft, the rotor shaft having a
 - 4 first end and a second end wherein the first end has an outer surface and a keyway
 - 5 formed in the outer surface, and the second end has flat, shallow threads;
 - 6 a coupling having a first coupling member for coupling to the motor shaft and a second
 - 7 coupling member for connecting to the rotor shaft, the second coupling member having a
 - 8 projection that is received in the keyway;
 - 9 a pump base having a pump chamber and a discharge; and
 - 10 a rotor positioned at least partially in the pump chamber including a connective portion
 - 11 having flat, shallow threads, the second end of the rotor shaft received in the connective
 - 12 portion
- 1 2. The pump according to claim 1 wherein the rotor shaft is comprised of graphite.
- 1 3. The pump according to claim 1 wherein the coupling is comprised of steel.
- 1 4. The pump according to claim 1 wherein the pump is a gas-release pump and includes a gas-
2 release conduit attached to the discharge.
- 1 5. The pump according to claim 1 wherein the pump is a gas-release pump and includes a metal-
2 transfer conduit attached to the discharge and a gas-release conduit attached to the metal-transfer
3 conduit.
- 1 6. A pump according to claim 1 wherein the pump is a transfer pump and includes a metal-transfer
2 conduit attached to the discharge.
- 1 7. The pump according to claim 1 wherein the projection is substantially the same length as the
2 keyway.
- 1 8. A rotor shaft for use in a molten metal pump, the rotor shaft having an outer surface, a first end
2 for connecting to a coupling and a second end for connecting to a rotor wherein the first end

- 3 includes a vertically-extending keyway formed on the outer surface, the keyway for receiving a
4 projection whereby the projection can apply driving force to the rotor shaft.
- 1 9. The rotor shaft of claim 8 that is comprised of graphite.
- 1 10. The rotor shaft of claim 8 wherein the outer surface is annular.
- 1 11. The rotor shaft of claim 8 wherein the first end does not include threads.
- 1 12. The rotor shaft of claim 8 wherein the keyway has a depth of $\frac{3}{8}$ " and a length of 3" – 4".
- 1 13. The rotor shaft of claim 8 wherein the keyway is formed at a 45 degree angle relative the
2 longitudinal axis of the rotor shaft.
- 1 14. The rotor shaft of claim 8 wherein the second end includes flat, shallow threads.
- 1 15. The rotor shaft of claim 8 that further includes a ceramic sleeve.
- 1 16. A coupling for use in a molten metal pump, the pump comprising a motor shaft and a rotor shaft,
2 the coupling comprising a first end for connecting to the motor shaft and a second end for
3 connecting to the rotor shaft, the second end including a longitudinally-extending projection to be
4 at least partially received in a keyway of the rotor shaft.
- 1 17. The coupling of claim 16 wherein the second end of the coupling does not include threads.
- 1 18. The coupling of claim 16 wherein the second end of the coupling comprises a cylindrical opening
2 having an inner surface, wherein the projection is positioned on the inner surface.
- 1 19. The coupling of claim 16 that is comprised of steel.
- 1 20. The coupling of claim 16 that further includes apertures for receiving a bolt.
- 1 21. A rotor for use in a molten metal pump, the rotor having a connective portion for connecting to an
2 end of a rotor shaft having flat, shallow threads, the connective portion having flat, shallow
3 threads configured to receive the flat, shallow threads of the end of the rotor shaft.
- 1 22. The rotor of claim 21 that is comprised of graphite.
- 1 23. The rotor of claim 21 that is trilobal.

- 1 24. The rotor of claim 21 that is a device including an inlet structure and a displacement structure for
2 displacing molten metal, whereby the inlet structure and displacement structure rotate as the rotor
3 rotates.
- 1 25. A rotor shaft for use in a molten metal pump, the rotor shaft having a first end for being received
2 in a coupling, the first end having flat, shallow threads.
- 1 26. The rotor shaft of claim 25 that further comprises a second end having flat, shallow threads, the
2 second end for attaching to a connective portion of a rotor.
- 1 27. The rotor shaft of claim 25 wherein the second end includes a taper for centering the shaft in the
2 bore.
- 1 28. A rotor shaft for use in a molten metal pump, the rotor shaft having a first end for being received
2 in a coupling and a second end for connecting to a rotor, the first end including keyway means for
3 receiving driving force from the coupling.
- 1 29. The rotor shaft of claim 28 wherein the second end includes connection means for connecting the
2 rotor shaft to the rotor.
- 1 30. The rotor shaft of claim 28 wherein the rotor shaft has an outer surface and the keyway means is a
2 vertical keyway formed in the outer surface of the rotor shaft.
- 1 31. The rotor shaft of claim 30 wherein the keyway means has a length of about 3".
- 1 32. The rotor shaft of claim 30 wherein the keyway means is formed parallel to the longitudinal axis
2 of the rotor shaft.
- 1 33. A rotor shaft for use in a molten metal pump, the rotor shaft having a first end for connecting to a
2 coupling and a second end including thread means for connecting to a connective portion of a
3 rotor and capable of applying at least some drawing force to the rotor.
- 1 34. The rotor shaft of claim 33 wherein the thread means comprise threads that are not pointed.
- 1 35. The rotor shaft of claim 33 wherein the thread means comprise threads that are not tapered.
- 1 36. the rotor shaft of claim 33 wherein the thread means comprise threads that are about .495" wide
2 and .100" deep.

1 37. The rotor shaft of claim 33 wherein the second end is tapered.